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# Interpreting the Evolving Nature of Transactions in Cyberteaching

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## Abstract

*This paper explores the nature and scope of web based teaching. It notes that the use of Web technology in the educational environment is transforming the nature of the delivery channels and teaching relationships. Furthermore, we are witnessing an emergence of radically different instructor ethics. The argument is conducted by evaluating the web based teaching initiatives at a university in Hong Kong. We have adapted the framework proposed by Vepsäläinen and Mäkelin (1987) to interpret various aspects of delivering teaching materials and student-teacher relationships.*

**Keywords:** Web based teaching; virtual learning; markets and hierarchy; student choice

## 1. Introduction

Advances in information and communication technologies have had a dramatic impact not only on the delivery of teaching material to students, but also on the nature, scope and content of materials presented by teachers. Nonetheless, changes in teaching methods are not taking place in a vacuum, since economic, organizational and social forces are increasingly making teaching and learning a complex process. In this paper we explore the nature and scope of web based teaching and argue that if the role of information technology (IT) in education is not defined clearly, there are risks that students may either be overwhelmed by information or exploited by the process. As a result of the introduction of new technology, and changes in both the delivery channels through which information is supplied, and the relationships between students and teachers, we are also witnessing the emergence of radically different instructor ethics. In this paper, the argument is conducted and the various issues reviewed by considering the case of web based teaching in a Hong Kong university. Theoretically the paper is grounded in the notion of markets and hierarchies (Williamson, 1975) and uses a modified version of the framework proposed by Vepsäläinen and Mäkelin (1987) to interpret various issues in web based teaching.

The paper is organized into five sections. Following a brief introduction, section two introduces the concept of markets and hierarchies as applied to educational institutions. Vepsäläinen and Mäkelin's (1987) theoretical concepts are discussed and a modified framework suitable for interpreting web based teaching is presented. Section three describes the case of web based teaching and interprets various aspects through the concepts in the Vepsäläinen and Mäkelin framework. Section four presents a discussion of issues emerging from the case study. Finally conclusions are presented in section five.

## 2. Theoretical Aspects of Learning Support Systems

In the context of economic activities, Ciborra (1993) identifies three kinds of organizational forms: markets, bureaucracies and clans. A *market* is characterized by an extreme form of competition and equitability of trade. There are no barriers to the market place and everybody can have access to the relevant information needed to carry out the economic exchange. In the context of an educational setting a pure market would exist if a student had total freedom of choice in taking up any course from any institution for a degree program and also had the ability to identify the relevant instructor. An instructor in turn would take on the role of a facilitator rather than a typical teacher. In such a situation a student would also have choice of where (s)he intended to take the course (i.e. at home, office, etc.).

A *bureaucracy* is defined as a “hierarchical arrangement of transactions based on social relationship known as legitimate authority” (Ciborra, 1993, p.117). With respect to teaching and learning, a bureaucracy exists when a student does not have any choice in determining either the nature and content of the courses or the nature of instruction. In such situations legitimate authority is implemented by virtue of a contract.

A *clan* relies on a high level of goal congruence, shared norms, values and traditions. A careful selection of individuals determines a high level of homogeneity and trust. Many educational institutions today function in a clan mode. Even private tuition and focused training could be characterized as corresponding to the clan form. Ciborra (1993) notes that although markets, bureaucracies and clans are the *ideal* types, in any real setting, all three organizational forms may coexist. It should, however, be possible to identify a particular form in a given setting.

One of the main objectives of any educational establishment is to leverage all known resources to impart knowledge to students. In that sense an educational institution can be considered as an arrangement enacted by the interaction of partially ignorant agents who need to acquire and subsequently communicate knowledge. Depending on the prevalent nature of organizational form, an instructor is merely a facilitator in the process of gaining knowledge. Two important questions emerge. First, what is the nature of the relationship between the teacher/facilitator and the student? Second, what mode or channel is adopted in the delivery of knowledge? Both these questions need to be addressed at two levels: in a traditional teaching environment and with respect to the new emerging forms of web-based learning.

While tackling complex design issues with respect to electronic markets in a corporate environment, Vepsäläinen and Mäkelin (1987) focus on the nature of relationships and the delivery channels to provide a synthesized framework to understand the various relationships. We have adapted the framework to study the changes, enabled by information technology, taking place in teaching and disseminating knowledge (see Figure 1).

The nature of the relationship between the teacher/facilitator and the student can be defined on basis of the scope and the type of student-teacher contact. In an educational setting, the scope ranges from *simple* to *complex*. Simplicity in scope refers to an undifferentiated relationship between, say, one teacher/facilitator and many students. A complex relationship on the other hand could take the form of customized service (e.g. private tuition). A majority of traditional institutions operate on a *simple* relationship model. As we begin to explore the role of IT in better resource utilization, particularly to develop, sustain and foster teacher-student interactions, the nature of relationships becomes increasingly complex. The type of

student-teacher contact could be relationship based or transaction based. Relationship based contacts exist in academia when a significant investment has been made in sustaining a particular relationship (e.g. a relationship between a doctoral student and the advisor). Transaction based contacts come into being when cost depends on the volume (e.g. in some undergraduate degree programs).

The delivery channel can be defined by the *channel type* and *channel structure*. In the context of disseminating teaching materials, channel types could range from stand-alone and decentralized ones (e.g. independent means adopted by an instructor to deliver teaching material) to a networked infrastructure (e.g. an institution-wide initiative). Channel structure could take the form of independent agents (e.g. private tuition) to internal institutional employees (as in the present day educational system) to self service by direct student access (this arrangement could be more prevalent in the future, however we are witnessing the beginnings in online institutions such as ZD University).

		Nature of student-teacher relationship		
		Customized	Standardized	Transaction based
Delivery Channel	Individual face to face contact	<b>Private tuition and focused training</b> <i>High costs and high fees</i>		exploiting the Student' <i>Costs vary according to volume of transactions</i>
	Traditional institutional employees		<b>raditional Universal Service'</b>	
	Network	<i>High fixed costs and risks, but low fees</i> verwhelming the Student'		<i>Low cost and low fees</i> <b>Emerging networked teaching/learning environments</b>

**Figure 1. Learning support system matrix (based on concepts proposed by Vepsäläinen and Mäkelin, 1987 and Ciborra, 1993)**

The original argument proposed by Vepsäläinen and Mäkelin (1987) is that arrangements along the diagonal (the shaded portion in figure 1) are the ideal ones. Any IT based solution that falls outside the diagonal is inefficient and could result in a problematic technological application. In the domain of IT enhanced teaching, this means that any course delivery that allows students to configure the offerings according to their own needs and at the same time expect personalized, individual teaching is bound to overwhelm the student and hence will not be an efficient arrangement. An arrangement where the cost of a particular course is going to be based on the number of registrants and any organizational structure affording this kind of an arrangement is also going to be ineffective. Furthermore the nature of organizational arrangements and postulated ideal situations, have implications for the nature and scope of student-teacher relationships. For example (refer to Figure. 1), since 'private tuition/focused training' and 'traditional universal arrangements' have been around for a

while, it is possible to bank on established ethical practices in managing and conducting the course. There are however number of issues of concern that need to be addressed in a 'networked teaching/learning environment'. Since there is no past history or precedence in dealing with such issues, much is left up to the instructors and students to judge as to what is right and wrong.

In the sections that follow, we shall consider the nature and scope of the emergent teaching arrangements in IT enhanced teaching. We position the case study in the 'networked teaching/learning' box and explore the benefits and pitfalls. We also postulate issues and concerns related to the teacher-student relationship.

### 3. The Case Study

This section reviews the case of IT enhanced web based teaching at a Hong Kong University. This site was chosen for a case study since during the 1998-1999 academic year there was a formal initiative to web-enable most of the undergraduate teaching in one Faculty. Subsequently these were referred to as CyberCourses. A software platform - FabWeb was developed with templates, into which course materials could be inserted. FabWeb uses the metaphor of a mansion: students 'arrive' at the front door, where they can see what resources are available on each floor of the mansion (see Figure 2). In this case study we are focusing on 2<sup>nd</sup> floor activities, though resources and activities on other floors may equally be applied to teaching support.



Figure 2. The *FabWeb* web site

When FabWeb was set up, it was anticipated that this web environment would support classrooms, meeting spaces, seminar rooms, staff offices - all the places where learning and teaching interactions occur. It was designed to be both fun for students and useful, with a wealth of information available. It should also be easy to use, with predominantly free software used. At the same time, it was believed that a web enabled mode of information

delivery should reduce both the cost and the effort involved in content creation, while offering a wider variety of information 'channels', including video.

### 3.1 Mode or channel is adopted in the delivery of knowledge

To understand how FabWeb operates in practice, we now take a brief look at one final year undergraduate course. The template for this page (see Figure 3) has a number of columns for different types of information - Videos, PowerPoint Slides, Supplementary Materials, and so forth.

This template can be accessed by the course instructor through Microsoft FrontPage and the materials copied from the instructor's local hard disk to the web page, where they are linked to appropriate text in the template. Thus, one might type "Lecture 1" in the PowerPoint Slides and Week 1 cell, and then hyperlink this 'text' to the file that contains the Lecture\_1.ppt file, for example. When students access the MIS\*\*\*\* web page and click on the link for "Lecture 1", the PowerPoint file will be opened or saved to the local desktop. The video files are in RealPlayer G2 streaming video format. Typically, a lecture is videoed and then coded into RealPlayer format. This coded version of the file is uploaded by the technical staff to the course web page. Students need to have access to a 28.8K modem (or faster) in order to be able to view the video files.



Week	Title	Video	Powerpointslides	Word document	Others	Supplementary Materials
1	Introduction		<a href="#">98BLec1.ppt</a>	<a href="#">Week One Tutorial</a>	<a href="#">Syllabus</a>	<a href="#">2nd International Conference on Privacy and Personal Data Pro.</a>
2	Computer Ethics and Current Attitudes		<a href="#">98BLec2.ppt</a>	Free for Coursework Planning	<a href="#">Cyberethics</a>	<a href="#">Basic Law of Hong Kong</a> <a href="#">ACM-CDC.doc</a> <a href="#">BCS-CDC.doc</a> <a href="#">BCS-COP.doc</a>
3	A Framework for Solving Ethical Dilemmas		<a href="#">98BLec3-student.ppt</a> <a href="#">Lec3</a>	<a href="#">Week Three Tutorial</a>	<a href="#">Coursework</a>	<a href="#">BSA</a> <a href="#">China.doc</a>
4	ILAC Guest Lecture			<a href="#">Week four Tutorial</a>		<a href="#">Computers Freedom a Privacy 99</a> <a href="#">Email Security</a>

**Figure 3. The MIS\*\*\*\* Template**

A year after this pilot project was started, another project using the commercial WebCT software was initiated in another department with similar intent to the FabWeb project. More recently, the University introduced a strategic plan for the use of IT in the University. One element of this plan includes the use of IT in teaching, thus reflecting the value of the FabWeb and WebCT pilot studies. As a result, a new University unit (Web Teaching Support Services -WTSS) has been established that has a mandate of expanding the University's use of the web for teaching support - along the lines of the FabWeb and WebCT studies. This unit employs several full time staff including Teaching Development Coordinators (who will

discuss how to web-enable courses with members of the academic staff), and programming/technical support staff (who maintain equipment and develop specific software solutions for courses, including animation, simulation, etc.), and an army of student helpers. Many of the students are be drawn from courses that are themselves web-enabled, thus providing the students with the opportunity to 'see behind the scenes' how the production of materials takes place, and perhaps motivating them in their own studies.

### ***3.2 Nature of the relationship between the teacher/facilitator and the student***

In Semester A, 1999, approximately 120 *CyberCourses* were running on FabWeb or WTSS platforms (about 12% of all courses run at the University). These *CyberCourses* have revealed many interesting dynamics with respect to teaching with web support that are useful to discuss. Firstly, *CyberProfessors* need to be sure that students both know how, and have the means, to access the webpage and its various materials. This cannot be taken for granted, since some students, notably those in Arts or Humanities departments, often lack this basic level of competence. Indeed, fledgling *CyberProfessors* themselves often have minimal knowledge when they start a *CyberCourse* and themselves need to undergo training. Increasingly, students do have home or work access to an Internet-connected PC, but those that do not will need to make use of computer resources available on site at the university. For those connecting from home, not all have access to the latest versions of office software. This may mean that the instructor has to prepare several versions of each file - to ensure that all students can access material. Equally, there may be a need for graphics-intensive and non-intensive versions of files - downloading a PowerPoint slide show of several megabytes over a 28.8k modem can take several hours.

Assuming that students can access materials, the *CyberProfessor* is free to make available a very wide range of materials to students, in a format that encourages students to decide which materials they wish to read/view, rather than force-feeding them. This should encourage students to take the initiative in their own learning. Nonetheless, it is still necessary to convince students that this mode of learning is advantageous. Not only do students have the content to learn, but they also need to learn about the processes involved - even the relatively simple processes of accessing information. It may be argued that all university graduates should be both computer and information literate, i.e. able to use computer resources to access the Internet and cognizant of what can then be done with the information that they access. However, such an attitude cannot be assumed with many students preferring that their professors preserve the cocoon of security by providing handouts and safe formulae that are perceived to guarantee their safe passage through the university system.

Indeed, a further change for students lies in the new style of material distribution. No longer can students rely on handouts from instructors, where they may expect to find all that they need to know in order to pass exams. Now they will have to be responsible to a much greater extent for their own learning, their own accessing of information. Thus, the system changes from a spoon-feeding mode to a self-directed mode. If students choose not to access the web to acquire information, they may end up rather worse off than their peers who are more assiduous and creative in their information sourcing techniques.

Finally, it is useful to note that the web is in some respects a much richer environment for information access than paper based documents. Whilst the value of knowledge in books and journals can never be underestimated and is certainly of great importance, the web represents an entirely different, parallel universe of information. Search engines, if competently used,

can provide a wealth of information that would be hard to access through traditional information seeking methods. This is not to say, however, that one always gets the information one needs - the perils of information overload are all too obvious. Documents on the web can be hyperlinked to other, external sources of information. Thus an instructor may choose to insert hyperlinks into his web documents - hyperlinks that students can follow so as to glean information from alternative sources. Indeed, the Supplementary Materials column of the MIS\*\*\*\* web page in Figure 3 grew rapidly through the duration of the course, with new hyperlinks being added every few days.

No formal survey of students' perceptions regarding the quality of learning has yet been undertaken. However, informal feedback from students is encouraging, many reporting that they value the availability of materials on line and appreciate the active nature of courses, i.e. their continuous evolution. In particular, students observe that they can: "attend" a lecture from a remote location (e.g. home, work, etc.) if they are unable to attend in person (this is especially true for part-time, evening students); "re-attend" lectures, or parts of lectures, remotely, if they feel that they missed some materials during the live lecture; re-familiarize themselves with material before exams and tests; incorporate electronic versions of lecture notes, presentation slides, etc. into a portfolio of their own course notes. Students are thus able to schedule their learning on a course in a frame that is convenient for them, enabling them to attend other classes with which there might usually be timetable clashes. Furthermore, with a wide variety of materials accessible on a 24-hours per day basis, students can rely on the *CyberCourse* webpage as a permanent resource where they can find materials useful for their learning.

A challenge associated with web-supported teaching is that students may claim that they are not coming to classes because they are watching the videos of lectures and reading the web documents - at home. Taken at face value, this would appear to represent a sensible use of the online course material. However, in our experience, many students will use the web-enablement to skip classes, and the result appears in exam scripts, by which time it is too late. It is probably therefore advisable to track student logins to the system, perhaps via username/password monitoring. Providing incentives to students to log in may also be possible, for instance by requiring that they take an online test every week - test material being drawn from the week's lecture material.

#### **4. Discussion**

We anticipate that the WTSS unit's provision of web enabling and advice to a wide user population at the University will encourage experimentation with new instructional and learning styles. As a service provider, the unit prefers to help academic staff realize their own objectives, saying "Yes, you can." to "Can I do this?" type questions. Naturally, the unit can also suggest various ways in which the technology can be used, but the intent is that the academic staff need to learn to think how they can make best use of the technology. Indeed, to function effectively, *CyberCourses* need to be marketed to the University community, with academics who may traditionally have been wary of this type of course encouraged to try it out - at no financial cost to themselves, but with the potential of creating an educational product that attracts their students, obtains the appreciation of their Dean, and illustrates to others in their department or faculty what can be done. Initial reactions to the WTSS unit's services (including seminars and workshops on the web enabling of teaching materials) have been very positive, with overwhelming demand for assistance. It is planned that the unit will need to expand in the near future if we are not to run the risk that academics are frustrated by



the unit's lack of resources to help them. Clearly, there is an appreciation for the value of this new style of information delivery and the relationships that it will spawn.

Despite the optimistic note that we have sounded in this paper, there are clearly issues of concern that should be raised. Firstly, *CyberProfessors*, as well as universities more generally, need to examine issues of Intellectual Property Rights and instructor accountability for materials delivered. For example, do instructors, their deans, or the university hold copyright for created materials? Who will make the decision about re-use of materials, for example in the case of a distance learning course that the dean decides to offer as a moneymaking venture? Furthermore, where does responsibility lie if publicly accessible material offends a local tycoon, for example, where an instructor chooses an unfortunate example to illustrate data security in a firm, exposing company "secrets" and causing loss of face – or customer confidence?

Recent advice (Selby, 1999) received from the Intellectual Property Department of the Hong Kong Government suggests that when a web page contains links to external sites (as in the Supplementary materials column of Figure 3), permission must be obtained from the webmasters of the sites hyperlinked to beforehand. This is a radically different interpretation of copyright law which may have significant impacts for web development more generally, perhaps contributing to a retardation in web development - obtaining such permission is not especially onerous, but does take time. Some webmasters, when so requested, have in turn requested that only certain pages in their domain be hyperlinked to, for example requiring 'visitors' to come in through the front door rather than linking direct to inside pages. Another webmaster requested that the company logo be displayed on the linking page - a form of advertising essentially, perhaps in lieu of royalty payment for that permission to link. These are new and evolving issues that have been little considered in the web literature to date, and will certainly require further work in future.

On the human side, by having a mix of audio and visual display on the web we may be changing the warm and intimate environment of the classroom into a cool and a distant one. By no means do all instructors (or students) appreciate this loss of intimacy, and a careful balance between web-enablement and interpersonal interaction needs to be maintained. On the other hand, one could argue that online instruction had to happen. In a traditional setting, a 'course' was considered a 'product' that had to be produced and delivered with the greatest precision (i.e. quality) and in the most cost effective manner (i.e. a classroom). However advances in information and telecommunication technologies have begun to influence the way we live and work. As a consequence, there is greater demand on making the educational product, a course, available in timely and a flexible manner. While quality and cost will remain important, quick response and flexibility are emerging as new forces behind *CyberCourses*.

## **5. Conclusions**

There is a very real danger that students may leave traditional learning environments in droves and move to more attractive online environments, if the traditional venues do not start to provide that same hi-tech functionality. This is not to suggest that a technologically-deterministic mode of education, where all hi-tech things are automatically good, is recommended. The requirement for quality and relevance must be retained. But we must reconsider mode of delivery and relationship issues in this information age if we are to retain our influence and involvement in the global education business. It will then be up to us to

ensure that the appropriate standards are enforced. In general, we are guardedly optimistic about the way in which *CyberCourses* are developing. However, there is a clear requirement that we should understand the nature of transactions and the relationships that exist between students and teachers in the Cyber Teaching environment, given the fact that this medium of interaction is likely to expand in the future. Furthermore, the legal and ethical aspects of the Cyber Teaching environment cannot be ignored: it will become an area of increasing relevance since the manner in which materials are delivered will become the object of scrutiny and cyberlaws will need to be developed to regulate this domain.

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